



UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of:

Masahiro Inui

Group Art Unit: 3744

Serial No.: 10/534,016

Examiner: Leonard R. Leo

Filed: May 5, 2005

P.T.O. Confirmation No.: 3369

For: CRACKING TUBE HAVING HELICAL FINS

REQUEST FOR RECONSIDERATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Date: January 17, 2008

Sir:

Reconsideration of the rejections contained in the Office Action dated September 21, 2007, in the above-identified application in view of the following detailed comments is respectfully requested.

In the Office Action, claims 1, 2 and 4 were rejected under 35 USC § 102(b) as being anticipated by the patent publication to Inui et al (presumably JP 09-243283 cited in the Information Disclosure Statement of May 5, 2005). In addition, dependent claims 3 and 5 were rejected under 35 USC § 103(a) as being unpatentable over the same publication to Inui et al.

In making the former rejection, it basically was asserted that the cited patent publication teaches a cracking tube having all of the features set forth in the noted claims.

As to the latter rejection, it apparently was acknowledged that the Inui et al publication does not specifically teach the ratio of TW/C as claimed. However, it then was asserted that it would have been obvious to one of ordinary skill in the art as to optimize a result-effective variables defined by this ratio to achieve the desired pressure drop and heat exchange. Reconsideration of this rejection in view of the following comments is respectfully requested.

Before discussing the rejection in detail, a brief review of the presently claimed invention may be quite instructive. The presently claimed invention provides a cracking tube having fins which are formed on an inner surface thereof and which are inclined with respect to an axis of the tube, for stirring a fluid inside the tube. In addition, the fins are arranged discretely on one or a plurality of helical loci. Further, the tube inner surface has regions wherein no fins are present over the entire axial length of the tube from one axial end of the tube to the other axial end thereof.

According to the cracking tube of the presently claimed invention, pressure loss of fluid material flowing through the tube is minimized due to the structure of the tube inner surface having regions wherein no fins are present over the entire axial length of the tube from one axial end of the tube to the other axial end thereof. At the same time, heat transfer to the fluid within the tube is promoted due to the helical arrangement of inclined fins. These particular features of the presently claimed cracking tube provide, among other

things, an improvement in ethylene yields during operation of thermal cracking reaction.

It is submitted that, contrary to the assertions contained in the rejections, the cited Inui et al publication does not teach or suggest the presently claimed invention. More particularly, it is submitted that the invention as defined by present claim 1 relates to a cracking tube which includes, among other things, an arrangement of fins inclined with respect to the tube axis which distinguishes over the tube shown in Fig. 6 of the Inui et al publication. It appears that this specific feature of the arrangement of "fins" described in claim 1 wherein the fins are inclined with respect to an axis of the tube has not been considered in formulating the subject rejection. Further, the angle as defined in dependent claim 2 refers to an inclination relative to the tube axis, not an inclination of the fin per se as set forth in the Action, and thus the assertions based on Fig. 1 of Inui et al relative to the subject matter of this claim also has no proper basis.

In addition to the above, the claimed subject matter further distinguishes over the entire disclosure of the Inui et al publication in that it does not teach or suggest the combination of "helical arrangement of inclined fins" and "no-fin regions in the tube axis direction" of the present cracking tube. A cracking tube as shown in Fig. 6 of the Inui et al publication apparently has "no-fin regions in the tube axis direction," but this cracking tube does not have a "helical arrangement of inclined fins." This disclosed tube having discontinuous fins provided in a row in a straight line in parallel to the tube axis has a fin

arrangement corresponds to Tube T4 disclosed in Table 1 of the present specification. Tube T4 is indicated as being inferior to Tube T1 (an example according to the present invention) in heat transfer characteristics and, in addition, has the problem of permitting coking in addition to a lower yield of ethylene.

A cracking tube as shown in Fig. 9 of the Inui et al apparently has a "helical arrangement of inclined fins," but does not have "no-fin regions in the tube axis direction." More specifically, Fig. 9 apparently shows a tube with an arrangement of discrete fins formed on adjacent helical lines, but the fins adjacent in the tube axis direction are offset to each other. Therefore, the cracking tube of Fig. 9 of the Inui et al publication does not have regions wherein no fins are present over the entire axial length of the tube from one axial end of the tube to the other axial end thereof as claimed. A cracking tube with this fin arrangement would corresponds to Tube T3 disclosed in Table 1 of the present specification. Tube T3 has a greater pressure loss than Tube T1 (an example according to the present invention) and results in a lower yield of ethylene.

It is further submitted that one of ordinary skill in the art would have no motivation to combine the structures of the cracking tubes shown in Figs. 6 and 9 of the Inui et al publication. Among other things, the cracking tube according to Fig. 6 is an example prepared by the welding operation of the movement of the welding torch 4 only in the direction of the tube axis x. On the other hand, the cracking tube according to Fig. 9 is an

example prepared by the welding operation of both the rotation of the tube 1 and the movement of the welding torch 4 in the direction of the tube axis x. Thus, the cracking tubes according to Figs. 6 and 9 are prepared by different welding processes. Since these examples of cracking tubes are independent from each other, there would be no motivation to those of ordinary skill in the art to combine the tube structures according to Figs. 6 and 9. Therefore, it is considered that the Inui et al publication in no manner suggests or recognizes a combination of Fig. 6 and Fig. 9.

In support of the above, attention is directed to the attached translation of the Inui et al publication with respect to the paragraphs [0008] to [0010] wherein the examples of welding operation as conducted are described in detail.

For the reasons stated above, withdrawal of the rejection under 35 U.S.C. § 103(a) and allowance of claims 1 through 5 over the cited patent publication are respectfully requested.

In view of the foregoing, it is submitted that the subject application is now in condition for allowance and early notice to that effect is earnestly solicited.

In the event this paper is not timely filed, the undersigned hereby petitions for an appropriate extension of time. The fee for this extension may be charged to Deposit

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Account No. 01-2340, along with any other additional fees which may be required with respect to this paper.

Respectfully submitted,

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